P1451.5.5

Type of Project: New IEEE Standard
Project Request Type: Initiation / New
PAR Request Date: 17 Mar 2021
PAR Approval Date: 21 May 2021
PAR Expiration Date: 31 Dec 2025
PAR Status: Active

1.1 Project Number: P1451.5.5
1.2 Type of Document: Standard
1.3 Life Cycle: Full Use

2.1 Project Title: Standard for a Smart Transducer Interface for Sensors and Actuator -- Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats – LoRa Protocol

3.1 Working Group: IEEE 1451.5.5 Working Group(IES/IES/1451.5.5 WG)
    3.1.1 Contact Information for Working Group Chair:
    Name: Kim Fung Tsang
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    3.1.2 Contact Information for Working Group Vice Chair:
    None
3.2 Society and Committee: IEEE Industrial Electronics Society/Industrial Electronics Society Standards Committee(IES/IES)
    3.2.1 Contact Information for Standards Committee Chair:
    Name: Cheng-Jen Chen
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    3.2.2 Contact Information for Standards Committee Vice Chair:
    None
    3.2.3 Contact Information for Standards Representative:
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3.3 Co-Stds Committee(s):
    3.3.1 IEEE Instrumentation and Measurement Society/TC9 - Sensor Technology (IM/ST)
    Contact Information for Standards Committee Chair:
    Name: Kang Lee
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4.1 Type of Ballot: Individual
4.2 Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot: Dec 2023
4.3 Projected Completion Date for Submittal to RevCom: Sep 2024

5.1 Approximate number of people expected to be actively involved in the development of this project: 20
5.2 Scope of proposed standard: The standard defines a smart sensor interface using Long-Range (LoRa) protocol. A LoRa system includes the end devices, gateways, network servers and application servers. This standard defines the standardized design and specifications of LoRa smart sensor interface to achieve data accuracy, interoperability (plug-and-play) based on the IEEE 1451.0 transducer services, security, privacy and harmonized performance of LoRa systems. In addition, this standard includes the wireless transducer interface module (WTIM) or end devices, network capable application processor (NCAP) (gateway device, or 1451 server), and application (1451 client), and appropriate transducer electronic data sheet (TEDS). The standard defines the Application Programming Interfaces (APIs) between WTIM and NCAP (1451 server), secure and private communication, harmonized radio frequency planning. In summary, this standard provides guidance of smart sensor system interface to improve the data accuracy, security, privacy and quality-of-services (QoS).

5.3 Is the completion of this standard contingent upon the completion of another standard? Yes
Explanation: IEEE P1451.0 and IEEE P1451.5 (refer to section 8.1).
5.4 Purpose: The purpose of this standard is to provide a transparent, efficient, and standardized design structure for developing LoRa smart sensor system interfaces. The design structure includes data accuracy, interoperability (plug-and-play), security, and privacy components, together with guidance on improving the

overall performance of various applications with the standardized interface design. This standard provides a resource for designers and developers of systems to enable rapid, positive and standardized progress of Internet-of-Things (IoT) industry.

5.5 Need for the Project: LoRa is an IoT wireless technology developed for unlicensed band-based IoT applications with the salient features of low-power, high-scalability, and long-range. As such, a huge number of devices and systems will be connected and integrated to facilitate pools of smart applications. LoRa defines the lower physical layer only LoRaWAN ® is the most commonly adopted protocol that defines the upper layer. The receiver sensitivity of LoRa is better than -140 dBm, hence the operation range is much longer than typical wireless and mobile telephony protocols. Therefore, LoRa is considered as long range. Since LoRa smart sensor systems operate in unlicensed bands, uncoordinated communications between LoRa networks may incur severe signal/channel collision, resulting in low quality-of-service (QoS). In addition, the lack of security and privacy measures of LoRa smart sensor systems may threaten public safety, such as unauthorized access of sensitive public information. At this point, there is no known priori standard on LoRa smart sensor interface. The standardization of LoRa smart sensor interface, namely IEEE 1451.5.5, becomes an essential part to achieve data accuracy, high interoperability, security and privacy. This standard aims at defining a universal LoRa smart sensor interface to regulate smart sensor performance from the radio physical layer to the network layer. This standard facilitates developers to establish an accurate, interoperable (plug-and-play), secure, private, and harmonized LoRa systems and applications. As a result, stakeholders e.g., government, consumers, entities, etc. may efficiently adopt and implement the LoRa solutions in commercial deployment, thus shortening the development cycle.

5.6 Stakeholders for the Standard: Manufacturers and users of IoT products, personal computers, enterprise networking devices, consumer electronic devices, and home networking equipment; Producers of industrial sensors, and mobile devices; Cellular operators and equipment manufactures; Vehicle manufacturers; Private / public sectors, enterprise infrastructure providers; and other wireless operators.

6.1 Intellectual Property

6.1.1 Is the Standards Committee aware of any copyright permissions needed for this project?
No

6.1.2 Is the Standards Committee aware of possible registration activity related to this project?
No

7.1 Are there other standards or projects with a similar scope? No
7.2 Is it the intent to develop this document jointly with another organization? No

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8.1 Additional Explanatory Notes: IEEE P1451.0 and IEEE P1451.5 are targeted to be completed by end of December 2021.

P1451.0, Standard for a Smart Transducer Interface for Sensors, Actuators, Devices, and Systems - Common Functions, Communication Protocols, and Transducer Electronic Data Sheet (TEDS) Formats.
Source: IMS TC-9 P1451.0 Working Group

P1451.5, Standard for a Smart Transducer Interface for Sensors and
Actuator - Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats.
Source: IMS TC-9 P1451.5 Working Group